Update of the measurement of the cross section for
$e^+e^- \to \psi(3770) \to$ hadrons

D. Besson,[1] T. K. Pedlar,[2] D. Cronin-Hennessy,[3] K. Y. Gao,[3] D. T. Gong,[3] J. Hietala,[3] Y. Kubota,[3] T. Klein,[3] B. W. Lang,[3] R. Poling,[3] A. W. Scott,[3] A. Smith,[3] S. Dobbs,[4] Z. Metreveli,[4] K. K. Seth,[4] A. Tomaradze,[4] P. Zweber,[4] J. Ernst,[5] K. Arms,[6] H. Severini,[7] S. A. Dytman,[8] W. Love,[8] S. Mehrabyan,[8] J. A. Mueller,[8] V. Savinov,[8] Z. Li,[9] A. Lopez,[9] H. Mendez,[9] J. Ramirez,[9] G. S. Huang,[10] D. H. Miller,[10] V. Pavlunin,[10] B. Sanghi,[10] I. P. J. Shipsey,[10] G. S. Adams,[11] M. Anderson,[11] J. P. Cummings,[11] I. Danko,[11] J. Napolitano,[11] Q. He,[12] H. Muramatsu,[12] C. S. Park,[12] E. H. Thorndike,[12] T. E. Coan,[13] Y. S. Gao,[13] F. Liu,[13] M. Artuso,[14] C. Boulahouache,[14] S. Blusk,[14] J. Butt,[14] J. Li,[14] N. Menaa,[14] R. Mountain,[14] S. Nisar,[14] K. Randrianarivony,[14] R. Redjimi,[14] R. Sia,[14] T. Skwarnicki,[14] S. Stone,[14] J. C. Wang,[14] K. Zhang,[14] S. E. Csorna,[15] G. Bonvicini,[16] D. Cinabro,[16] M. Dubrovin,[16] A. Lincoln,[16] R. A. Briere,[17] G. P. Chen,[17] J. Chen,[17] T. Ferguson,[17] G. Tatishvili,[17] H. Vogel,[17] M. E. Watkins,[17] J. L. Rosner,[18] N. E. Adam,[19] J. P. Alexander,[19] K. Berkelman,[19] D. G. Cassel,[19] J. E. Duboscq,[19] K. M. Ecklund,[19] R. Ehrlich,[19] L. Fields,[19] L. Gibbons,[19] R. Gray,[19] S. W. Gray,[19] D. L. Hartill,[19] B. K. Heltsley,[19] D. Hertz,[19] C. D. Jones,[19] J. Kandaswamy,[19] D. L. Kreinick,[19] V. E. Kuznetsov,[19] H. Mahlke-Krüger,[19] T. O. Meyer,[19] P. U. E. Onyisi,[19] J. R. Patterson,[19] D. Peterson,[19] E. A. Phillips,[19] J. Pivarski,[19] D. Riley,[19] A. Ryd,[19] A. J. Sadoff,[19] H. Schwarthoff,[19] X. Shi,[19] S. Stroiney,[19] W. M. Sun,[19] T. Wilksen,[19] M. Weinberger,[19] S. B. Athar,[20] P. Avery,[20] L. Breva-Newell,[20] R. Patel,[20] V. Potlia,[20] H. Stoeck,[20] J. Yelton,[20] P. Rubin,[21] C. Cawlfield,[22] B. I. Eisenstein,[22] I. Karliner,[22] D. Kim,[22] N. Lowrey,[22] P. Naik,[22] C. Sedlack,[22] M. Selen,[22] E. J. White,[22] J. Wiss,[22] M. R. Shepherd,[23] D. M. Asner,[24] and K. W. Edwards[24]

(CLEO Collaboration)

[1]*University of Kansas, Lawrence, Kansas 66045*
[2]*Luther College, Decorah, Iowa 52101*
[3]*University of Minnesota, Minneapolis, Minnesota 55455*
[4]*Northwestern University, Evanston, Illinois 60208*
[5]*State University of New York at Albany, Albany, New York 12222*
[6]*Ohio State University, Columbus, Ohio 43210*
[7]*University of Oklahoma, Norman, Oklahoma 73019*
[8]*University of Pittsburgh, Pittsburgh, Pennsylvania 15260*
[9]*University of Puerto Rico, Mayaguez, Puerto Rico 00681*
[10]*Purdue University, West Lafayette, Indiana 47907*
[11]*Rensselaer Polytechnic Institute, Troy, New York 12180*
[12]*University of Rochester, Rochester, New York 14627*
[13]*Southern Methodist University, Dallas, Texas 75275*
[14]*Syracuse University, Syracuse, New York 13244*
[15]*Vanderbilt University, Nashville, Tennessee 37235*
[16]*Wayne State University, Detroit, Michigan 48202*
[17]*Carnegie Mellon University, Pittsburgh, Pennsylvania 15213*
[18]*Enrico Fermi Institute, University of Chicago, Chicago, Illinois 60637*
[19]*Cornell University, Ithaca, New York 14853*

[20]*University of Florida, Gainesville, Florida 32611*
[21]*George Mason University, Fairfax, Virginia 22030*
[22]*University of Illinois, Urbana-Champaign, Illinois 61801*
[23]*Indiana University, Bloomington, Indiana 47405*
[24]*Carleton University, Ottawa, Ontario, Canada K1S 5B6*
and the Institute of Particle Physics, Canada

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Abstract

We have updated our measurement of the cross section for $e^+e^- \to \psi(3770) \to$ hadrons , our publication "Measurement of $\sigma(e^+e^- \to \psi(3770) \to$ hadrons$)$ at $E_{\mathrm{c.m.}} = 3773$ MeV", arXiv:hep-ex/0512038, Phys. Rev. Lett. **96**, 092002 (2006). Simultaneous with this arXiv update, we have published an erratum in Phys. Rev. Lett. **104**, 159901 (2010). There, and in this update, we have corrected a mistake in the computation of the error on the difference of the cross sections for $e^+e^- \to \psi(3770) \to$ hadrons and $e^+e^- \to \psi(3770) \to D\bar{D}$. We have also used a more recent CLEO measurement of cross section for $e^+e^- \to \psi(3770) \to D\bar{D}$. From this, we obtain an upper limit on the branching fraction for $\psi(3770) \to$ non-$D\bar{D}$ of 9% at 90% confidence level.

In our previous publication [1], we reported a measurement of the cross section, $\sigma(e^+e^- \to \psi(3770) \to \text{hadrons}) \equiv \sigma_{3770} = (6.38 \pm 0.08^{+0.41}_{-0.30})$ nb. Then, using an earlier CLEO publication [2], which gave $\sigma(e^+e^- \to \psi(3770) \to D\bar{D}) \equiv \sigma_{D\bar{D}} = (6.39 \pm 0.10^{+0.17}_{-0.08})$ nb, we obtained the cross section for non-$D\bar{D}$ decays of $\psi(3770)$, $\sigma_{\text{non}-D\bar{D}} \equiv \sigma_{3770} - \sigma_{D\bar{D}} = (-0.01 \pm 0.08^{+0.41}_{-0.30})$ nb. The uncertainties on this difference made incorrect assumptions about the correlations between the uncertainties on the two measurements. The correct value is $\sigma_{\text{non}-D\bar{D}} = (-0.01 \pm 0.13^{+0.41}_{-0.33})$ nb. In this result, the systematic uncertainty in luminosity, correlated between the measurements of σ_{3770} and $\sigma_{D\bar{D}}$, cancels. The remaining systematic uncertainties, uncorrelated between the two measurements, are combined in quadrature.

While reporting the correction to our publication, we take the opportunity to update the measurement of $\sigma_{D\bar{D}}$ to CLEO's latest value [3], $\sigma_{D\bar{D}} = (6.57 \pm 0.04 \pm 0.10)$ nb. With this new value, because of different efficiencies for $D\bar{D}$ and non-$D\bar{D}$ final states, our value for σ_{3770} changes slightly, to $\sigma_{3770} = (6.36 \pm 0.08^{+0.41}_{-0.30})$ nb. Consequently, we now have $\Gamma_{ee}(\psi(3770)) = (0.203 \pm 0.003^{+0.041}_{-0.027})$ keV. The new value for $\sigma_{\text{non}-D\bar{D}}$ is $(-0.21 \pm 0.09^{+0.41}_{-0.30})$ nb. These values supersede the previous measurements [1]. Dividing this difference by σ_{3770} yields the branching fraction $\mathcal{B}(\psi(3770) \to \text{non-}D\bar{D}) = (-3.3 \pm 1.4^{+6.6}_{-4.8})$ % which corresponds to $\mathcal{B}(\psi(3770) \to \text{non-}D\bar{D}) < 9\%$ at 90% confidence level when considering only physical (positive) values.

[1] D. Besson *et al.* (CLEO Collaboration), arXiv:hep-ex/0512038; Phys. Rev. Lett. **96**, 092002 (2006).

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[3] S. Dobbs *et al.* (CLEO Collaboration), Phys. Rev. D **76**, 112001 (2007).